SWINGING ABUTMENT ROTARY PUMP

FIELD OF THE INVENTION

The invention is in the field of pumps, and more particularly rotary pumps of the type having an abutment within a stator chamber with inlet and outlet ports.

BACKGROUND OF THE INVENTION AND DESCRIPTION OF RELATED ART

The term "abutment pump" is used herein to refer to a device comprising a movable partition separating the inlet and outlet streams within a stator chamber or housing and a rotor that rotates within the chamber to cause sequential intake, compression, and the exhaust of a fluid medium such as a gas, a liquid, or combination thereof. The term, therefore, comprehends not only devices that cause fluid movement but also devices that compress or pressurize fluids with or without ignition or combustion. Further, the term "abutment pump" embraces a reverse operation in which fluid drives a rotor rather than the rotor driving the fluid, i.e., in reverse operation every pump is effectively a motor.

One example of an abutment configuration is shown in U.S. Pat. No. 2,238,395 to Nittka. The pump in the Nittka patent comprises a rotor working in unison with a flapper requiring numerous components. The device is characterized by the complexity of the many parts required to manipulate the flapper.

Another example of an abutment configuration is shown in U.S. Pat. No. 715,933 to Allen. The engine and pump in the Allen patent comprises dual abutments working in unison with rotary valves with exhaust stream traveling through a port in the rotor expelled through the driveshaft. The device is complicated and requires several parts working in combination with the abutments.

BRIEF SUMMARY OF THE INVENTION

The present invention comprises a pump structure having a stator chamber with a substantially continuous wall with intake and exhaust ports and swinging abutment pocket therein. The pump further comprises a centrically positioned shaft with an eccentrically mounted rotor within the chamber such that as the rotor rotates, the rotor maintains a wiping contact between a segment of the outside diameter of the rotor and the inner wall of the chamber. The swinging abutment affixed in the swinging abutment pocket maintains contact with the outside diameter of the rotor to effect intake, compression, and exhaust functions with each 360° (degrees) of rotor movement.

In an illustrative embodiment, the chamber inner wall is cylindrical and the rotor is comprised of a cylindrical body with a segment having contact with the chamber inner wall so that each 360° of rotation the rotor body is in contact with the inner wall except during the period when the rotor body is in direct contact with the conforming inner wall surface of the swinging abutment.

In the illustrative embodiment, the rotor body urged by centrifugal force has continuous wiping contact with the inner wall and the conforming inner wall surface of the swinging abutment.

In a further illustrative embodiment, the rotor body is provided with a drive slot engaged by a mating tongue of a drive member. In another form, the rotor body includes a tongue structure and the drive member includes a slot feature.

In one illustrative embodiment, the stator is provided with dual swinging abutments and additional intake and exhaust ports to create multiple pumping chambers within a stator.

In accordance with a preferred embodiment hereafter described, the trailing rotor body segment that contacts the inner wall has a wear compensating feature along the radius of the stator. The intake and exhaust ports are spaced-apart from each other and separated by the partition of a swinging abutment. As will be understood from the following specification, the pump of the present invention can be scaled to any desired capacity with pump components being constructed using any material or combination of materials including hard dense plastics such as HDPE, ceramics, cermets, and/or metals.

These and other features and advantages of the invention will become apparent from the detailed description below, in light of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view of a pump embodying the invention with the rotor in contact with the swinging abutment that separates the intake port and exhaust port.

FIGS. **2**A-**2**D make up a schematic, sequential showing of the rotor and swinging abutment position and fluid flow over approximately 360° of rotation.

FIG. **3** is a perspective view of the swinging abutment, rotor, and drive for the pump. Also shown are an alternative rotor bodies and drive members.

FIG. **4** is a plan view of an alternative pump having dual swinging abutments creating an additional pumping chamber.

For purposes of clarity and brevity, like elements and components will bear the same designations and numbering throughout the Figures.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIGS. **1** and **2**A-**2**D, there is shown a pump **10** comprising a stator **12** defining a cylindrical chamber having an inner wall **14** interrupted only by the spaced-apart intake (inlet) and exhaust (outlet) ports **16** and **18** respectively and the swinging abutment pocket **19** that accommodates the swinging abutment **17**. It is understood that a cover plate or other structure (not shown) closes the chamber when all parts described are installed. The chamber is cylindrical as defined by the inner wall, and has a geometric center at **20**.

An eccentrically mounted rotor **22** is comprised of a cylindrical body for rotation with an input structure, the axial drive post **28**. The rotor body has an outer diameter that is less than the diameter of the circular inner wall **14**. With rotation in a clockwise rotation when viewing the pump **10** in FIGS. **2**A-**2**D, a segment of the outside diameter of the rotor body is the contact or wiping surface against the inner wall. During rotation, there is continuous wiping contact with the chamber inner wall. In FIG. **2**B, note the swinging abutment **17** does not completely seal the outlet port **18**.

Rotor drive comes from driven post or shaft **28**, its location is the geometric center of the stator **20**. The swinging abutment **17** is located between intake and exhaust ports. The swinging abutment **17** is affixed in the swinging abutment pocket **19** which also allows for the swinging abutment to pivot maintaining edge contact with the rotor. Forces that act upon the swinging abutment to maintain edge contact with the rotor also act upon the pivoting joint **52** of the swinging abutment exerting a sealing action in the pivot joint **51** area of